B. Soil-Cement Stabilized Base, Subbase, and Shoulder Course

Where specified, soil-cement stabilized base, subbase, and shoulder course, in place and accepted, will be paid at the Contract Price per square yard (meter). Payment will be full compensation for roadbed preparation, mixing on the road, shaping, pulverizing, watering, compaction, defect repair, and maintenance.

C. Pre-mixed Soil-Cement Stabilized Base, Subbase, and Shoulder Course

Where specified, pre-mixed soil-cement stabilized base, subbase, and shoulder course, in place and accepted, will be paid at the Contract Price per ton (megagram) or square yard (meter).

Payment will be full compensation for roadbed preparation; all materials except Portland cement; loading, hauling, and unloading; mixing; spreading; watering; rolling and shaping; and maintenance.

D. Portland Cement

Portland cement will be paid at the Contract Price per ton (megagram). Payment is full compensation for furnishing, hauling, and applying the material. Only Portland cement incorporated in the finished course will be paid; no payment will be made for cement used to correct defects due to the Contractor's negligence, faulty equipment, or plant calibration error.

E. Fly Ash and Slag

Fly ash and slag will be paid at the Contract Price per ton (megagram), according to this Subsection. Payment will be full compensation for hauling and applying the materials. Only fly ash and slag incorporated into the finished course will be paid; no payment will be made for fly ash and slag used to correct defects due to the Contractor's negligence, faulty equipment, or plant calibration error.

Payment will be made under:

Item No. 301	Soil-cement material—including material and haul	per cubic yard (meter)
Item No. 301	Soil-cement stabilized base, subbase, and shoulder course ___in (mm)	per square yard (meter)
Item No. 301	Pre-mixed soil-cement stabilized base, subbase, and shoulder course—including material and haul	per ton (megagram) or per square yard (meter)
Item No. 301	Pre-mixed soil-cement stabilized base and shoulder course—including material and haul	per ton (megagram) or per square yard (meter)
Item No. 301	Portland cement	per ton (megagram)
Item No. 301	Fly ash and slag	per ton (megagram)

301.5.01 Adjustments

General Provisions 101 through 150.

Section 302—Sand-Bituminous Stabilized Base Course

302.1 General Description

This work includes constructing a base course composed of sand, or a mixture of sands that is stabilized with bituminous materials. Construct the base course according to these Specifications and to the lines, grades, and typical cross-sections shown on the Plans or established by the Engineer.

All of the provisions of Section 300 apply to this Item.

302.1.01 Definitions

General Provisions 101 through 150.

302.1.02 Related References

A. Standard Specifications

Section 105—Control of Work

Section 109—Measurement and Payment

Section 300—General Specifications for Base and Subbase Courses

Section 400—Hot Mix Asphaltic Concrete Construction

Section 412—Bituminous Prime

Section 814—Soil Base Materials

Section 821—Cutback Asphalt

Section 822—Emulsified Asphalt

Section 823—Cutback Asphalt Emulsion

B. Referenced Documents

AASHTO T 191

ASTM D 1138

GDT 7

GDT 8

GDT 59

GDT 67

302.1.03 Submittals

General Provisions 101 through 150.

302.2 Materials

Ensure that materials meet the requirements of the following Specifications:

Material	Specification
Sand for Bituminous Base	Subsection 814.2.03
RC-800	Subsection 821.2.01
Bituminous Prime: Cutback Asphalt, RC-30, RC-70, RC-250, or MC-30, MC-70, MC-250	Subsection 821.2.01
Emulsified Asphalt, EAP-1	Subsection 822.2.01
Cutback Asphalt Emulsion, CBAE-2	Subsection 823.2.01
Blotter Materials (Sand)	Subsection 412.3.05.G.3

Produce a sand-bituminous mixture with a resistance to plastic flow of 200 lbs (90 kg) minimum when tested according to ASTM 1138.

Produce a sand-bituminous mixture with a maximum 4 percent, 7-day absorption when tested according to GDT 8.

302.2.01 Delivery, Storage, and Handling

General Provisions 101 through 150.

302.3 Construction Requirements

A. General

1. Methods

   Use the central plant mixing method when the sand-bituminous stabilized base course is to be paid for by the ton (megagram). Mix, spread, and compact the material according to Section 400, with the following exceptions:

   - No test strip is required.
   - The Compaction Acceptance Schedule does not apply.

   Use either the central plant or traveling plant mixing method when the sand-bituminous stabilized base course is to be paid for by the square yard (meter).

Use the central plant mixing method when the sand-bituminous stabilized base course is used for widening in addition to the use of suitable special rollers for compaction.

Use plow and harrow mixing only for aeration according to Subsection 302.3.05.D.1, "Preparing Mixture for Compaction."

2. Temperature Limitations

Do not apply bituminous materials when the air temperature is less than 60 °F (15 °C) in the shade nor when the temperature of either the subgrade, subbase, or soil to be used in the mixture is below 50 °F (10 °C).

302.3.01 Personnel

General Provisions 101 through 150.

302.3.02 Equipment

Provide all necessary equipment (in satisfactory condition) on the Project before work commences. Use applicable equipment specified in Subsection 412.3.02, "Equipment" for bituminous prime.

302.3.03 Preparation

When constructing the base from new materials, prepare the subgrade or subbase as specified in Subsection 300.3.03.C, "Preparing the Subgrade." or Subsection 300.3.03.D, "Preparing the Subbase"

Prepare the subgrade or subbase by scarifying a minimum of 2 ft (600 mm) on each side of the Plan width and to the depth of material when the Engineer determines that any existing roadbed materials are suitable for mixed-in-place base construction.

Blend new materials with the prepared roadbed thoroughly before adding bituminous material.

302.3.04 Fabrication

General Provisions 101 through 150.

302.3.05 Construction

A. Process

1. In-Place Mixing
   a. The Engineer will determine the suitability of existing roadbed materials for inclusion in the base course.
   b. Remove all roots, sod, or rock more than 3 in (75 mm) in diameter and all other harmful materials from the roadbed during processing.
   c. Place additional new soil (sand) on the roadbed and spread it uniformly to the proper depth to obtain the Plan thickness of the compacted base course. Place materials only on dry, unfrozen subgrade or subbase.
   d. Loosen and pulverize the material to be stabilized without disturbing or damaging the underlying subgrade or subbase. Add water as needed to assist pulverization.
      - 100 percent of material shall pass the 1.5 in (37.5 mm) sieve.
      - A minimum of 80 percent of the soil (exclusive of stones or gravel) shall pass the No. 4 (4.75 mm) sieve.
   e. Provide moisture content between 2 and 8 percent by weight of the soil before adding the bituminous material. The moisture content shall be adjusted under the Engineer's direction.
      1) Add water at the mixer using accurate gauging devices.
      2) Ensure that the moisture is uniformly distributed.
   f. Shape the material to obtain the grade and cross- section required in the Plans. Windrow the material uniformly only if the mixing plant operation requires.
   g. Uniformly apply the bituminous material after adjusting the moisture content and shaping has been completed.
   h. Apply the bituminous material only as temperatures allow per the following table.

	Minimum	Maximum
RC-800 Cutback Asphalt	160 °F (70 °C)	210 °F (100 °C)

   i. Mix the sand-bituminous mixture in successive sections so that the roadway can be compacted full width in one operation. Ensure that a uniform mixture is produced.

2. Central Plant Mixing Method
    a. Thoroughly pulverize material so that 100 percent will pass through a 1.5 in (37.5 mm) sieve and at least 80 percent of the soil, excluding any stone or gravel, will pass through a No. 4 (4.75 mm) sieve.
    b. Adjust the moisture content of the pulverized base material according to Subsection 302.3.05.A.1.d.
    c. Mix as follows:
        1) Proportion the sand-bituminous material and water separately.
        2) Charge all materials into the mixer together and mix immediately.
    d. Mix until a uniform mixture is produced.
    e. Ensure that the temperature of the bituminous material is between 160 °F (70 °C) and 210 °F (100 °C) for mixing.
    f. Spread the sand-bituminous mixture to the proper depth to obtain the thickness required on the Plans of the finished base course.
        - Use an approved spreader.
        - Place sand-bituminous material only on a dry subgrade or subbase.

B. Quantity of Bituminous Material

The Engineer will determine the quantity of bituminous material required. Apply the bituminous material uniformly, using an amount within 5 percent of the required quantity.

If bituminous material is applied at a rate more than 5 percent in excess of the required amount and it is considered detrimental, remove and reconstruct the section. If the application rate is more than 5 percent and the material is left in place, no payment will be made for bituminous material in excess of the 5 percent tolerance.

Correct any shortage of bituminous material more than 5 percent less than the required amount by applying additional bituminous material. The cost of reapplying, remixing, and compacting will be included in this Pay Item at no additional cost to the Department.

C. Extent of Application

Limit the application of the bituminous material so that aeration and compaction can begin immediately after mixing.

D. Mixing

1. Preparing Mixture for Compaction
    a. Shape the base to line, grade, and cross-section indicated in the Plans.
    b. Aerate the mixture as follows:
        1) Begin aeration as soon as the prepared base is long enough to permit the operation of aeration equipment.
        2) Loosen and turn the mixture with harrows, blades, or the equivalent, until the volatile solvents and water evaporate and the mixture is tacky.
    c. If rain threatens the work, roll the surface enough to exclude as much rainwater as possible. Resume aeration as soon as weather permits.
2. Thickness of Courses
    a. Spread the base as follows:
        1) Spread to a maximum compacted lift thickness of 8 in (200 mm).
        2) Lay the maximum lift thickness for which the specified compaction is obtained, otherwise lay the base in more than one course.

E. Compacting and Finishing

Compact as soon as the condition of the material and the weather permit. Bring the base to line, grade, and cross-section. Roll until the full depth of the course is compacted to 95 percent of the maximum dry density of the sand, without bituminous material.

1. Single-Course Construction

    After the base has been compacted, do the following:

    a. Shape the course to line, grade, and cross-section again.

b. Roll the surface with a pneumatic-tired roller followed by a steel-wheel roller to seal the surface. Begin at the edges and work toward the center until the surface is smooth, closely knit, free from cracks, and in conformance with the proper line, grade, and cross section.

c. Correct any defects specified in Subsection 300.3.06.B, "Repairing Defects."

2. Multiple-Course Construction

After compacting the first course, do the following:

a. Shape the surface again to line, grade, and cross- section.

b. Spread and compact the second and succeeding courses as previously described.

c. Finish the surface according to the procedure specified for Single-Course Construction, above.

3. Compact Irregular Areas

Compact irregular areas inaccessible to a roller by using mechanical tampers approved by the Engineer. Density requirements are unchanged from above.

F. Prime Coat

Apply bituminous prime according to Section 412.

G. Preservation of Base

Maintain the base in a smooth and acceptable condition until it is covered by other construction.

1. Make repairs to any defects as specified in Subsection 300.3.06.B, "Repairing Defects."
2. Preserving the base as specified does not relieve the Contractor of the general duty to maintain The Work until it is accepted as specified in Section 105.

302.3.06 Quality Acceptance

A. Compaction Tests

Test compaction as follows:

1. Determine the maximum dry density from representative samples of the material before adding the bituminous material by GDT 7 or GDT 67.
2. Determine the in-place density of the base according to AASHTO T 191 or GDT 59

B. Finished Surface Tests

Check the finished surface of the base, subbase, or shoulder course as follows:

1. Check the longitudinal surface using a 15 ft (4.5 m) straightedge parallel to the centerline.
2. Check the transverse surface by using one of the following tools:
   a. A template, cut true to the required cross- section and set with a spirit level on non-superelevated sections
   b. A system of ordinates, measured from a stringline
   c. A surveyor's level
3. Ensure that ordinates measured from the bottom of the template, stringline, or straightedge, to the surface do not exceed 1/4 in (6 mm) at any point. Rod readings shall not deviate more than 0.02 ft (6 mm) from required readings.
4. Correct any variations from these requirements immediately according to Subsection 300.3.06.B, "Repairing Defects."

C. Thickness Tolerances

1. Thickness Measurements

Determine the thickness of the base, subbase, or shoulder course, by making as many checks as necessary to determine the average thickness.

2. Deficient Thickness
   a. If any measurement is deficient in thickness more than 1/2 in (13 mm), make additional measurements to determine the deficient area.
   b. Correct any area deficient between 1/2 in (13 mm) and 1 in (25 mm) to the design thickness by using one of the following methods according to these Specifications:
      - Apply Asphaltic Concrete 9.5 mm Superpave.
      - Leave in place and accept payment for the materials and area (if the course is mixed in place) at ½ the Contract Unit Price for the deficient area.

c. Correct any area deficient in thickness by more than 1 inch (25 mm) by applying Asphaltic Concrete 9.5 mm Superpave or removing the material to the full depth of the course and reconstructing to the required thickness in accordance with these Specifications.

d. If payment is made by the cubic yard (meter) or ton (megagram), payment for Asphaltic Concrete 9.5 mm Superpave to correct deficiencies will be made at the Contract Unit Price that applies to the course needing correction. Payment for additional material used in reconstructing an area will be made at the Contract Unit Price, but the removed material removed will be deducted from payment.

e. If payment is made by the square yard (meter), no payment will be made for additional material required to correct deficiencies or reconstructing deficient work.

3. Average Thickness

Average thickness is measured as follows:

a. The average thickness per linear mile (kilometer) is determined from all measurements within the mile (kilometer) increments except the areas deficient by more than 1/2 in (13 mm) and not corrected.

b. The average thickness shall not exceed the specified thickness by more than 1/2 in (13 mm).

c. If the basis of payment is per cubic yard (meter) or ton (megagram) and the average thickness for any mile (kilometer) increment exceeds the allowable 1/2 in (13 mm) tolerance, the excess quantity in that increment will be deducted from the Contractor's payments.

d. The excess quantity is calculated by multiplying the average thickness that exceeds the allowable 1/2 in (13 mm) tolerance by the surface area of the base, subbase, or shoulder, as applicable.

e. If the basis of payment is per square yard (meter), no deduction will be made for excess thickness.

302.3.07 Contractor and Warranty and Maintenance

General Provisions 101 through 150.

302.4 Measurement

A. Sand Bituminous Stabilized Base Course Materials

When a mixed-in-place construction method is used, any additional materials necessary to add to the roadbed will be measured by loose volume in cubic yards (meters) of additional material added according to Section 109.

B. Sand Bituminous Stabilized Base Course

When payment is by the square yard (meter), measure length along the centerline in feet (meters) and use the Plan width to calculate area. Use actual dimensions of irregular areas placed to calculate the number of square yards.

When payment is by the ton (megagram), measure the actual weight of the sand-bituminous mixture on approved scales.

C. Bituminous Materials

Measure bituminous materials incorporated into the mixture according to Section 109.

No separate measurement will be made for bituminous prime.

D. Unsuitable Material

Measure unsuitable material removed according to the Earthwork Item in the Contract.

302.4.01 Limits

General Provisions 101 through 150.

302.5 Payment

A. Base Course Material

Sand Bituminous Stabilized Base Course materials, in place and accepted, will be paid at the Contract Unit Price per cubic yard (meter), which shall be full compensation for furnishing the material where specified in the Pay Item, mixing the pit, for all loading, unloading, spreading as here specified, and for hauling where specified in the Pay Item.

B. Sand-Bituminous Stabilized Base Course

Sand-Bituminous Stabilized Base Course, complete in place and accepted, will be paid for at the Contract Unit Price per square yard (meter), which shall be full compensation for preparation of the roadbed, for mixing on the road, shaping, pulverizing, hauling, watering, compaction, repair of all defects, and maintenance

C. Sand-Bituminous Stabilized Base Course Pre-Mixed

Sand-Bituminous Stabilized Base Course, complete in place and accepted, will be paid for at the Contract Unit Price per ton (megagram) or per square yard (meter), which shall be full compensation for preparation of the roadbed, for all materials except bituminous materials, and for loading, unloading, all hauling, mixing, spreading, watering, rolling, shaping, and maintenance.

D. Bituminous Material

The number of gallons (liters) of bituminous material, except bituminous material in excess of the 5% tolerance and except that used as Bituminous Prime, will be paid at the Contract Unit Price per gallon (liter), complete and in place.

Payment is full compensation for providing bituminous material, hauling, heating, and applying the material.

E. Unsuitable Material

Removal of unsuitable material will be paid for according to the Earthwork Item in the Contract.

Payment will be made under:

Item No. 302	Sand-bituminous stabilized base course material, including material and haul	per cubic yard (meter)
Item No. 302	Sand-bituminous stabilized base course material, including haul	per cubic yard (meter)
Item No. 302	Sand-bituminous stabilized base course, ___ inch (mm)	per square yard (meter)
Item No. 302	Pre-mixed sand-bituminous stabilized base course, including material	per ton (megagram) or per square yard (meter)
Item No. 302	Bituminous materials	per gallon (liter)

302.5.01 Adjustments

General Provisions 101 through 150.

Section 303—Topsoil, Sand-Clay, or Chert Construction

303.1 General Description

This work includes constructing a base, subbase, or shoulder course using topsoil, sand-clay, or chert, stabilized with aggregate, where required.

Construct according to these Specifications and to the lines, grades, and typical cross-sections shown on the Plans or established by the Engineer.

All of the provisions of Section 300 apply to this Item.

303.1.01 Definitions

General Provisions 101 through 150.

303.1.02 Related References

A. Standard Specifications

Section 106—Control of MaterialsSection 202—Random Clearing and Grubbing

Section 205—Roadway Excavation

Section 206—Borrow Excavation

Section 300—General Specifications for Base and Subbase Courses

Section 412— Bituminous Prime

Section 803—Stabilizer Aggregate

Section 814—Soil Base Materials

Section 821—Cutback Asphalt